

18i 4-CYLINDER

ENGINE CODING

ENGINE IDENTIFICATION

Engine identification plate is located on left side of engine block above starter. First 3 characters show engine type, and last 2 identify engine equipment.

Engine Identification	
Application	Code
18i (1647 cc)	
Man. Trans.	843-7-18
Auto. Trans.	843-7-19

ENGINE & CYLINDER HEAD

ENGINE

Removal — 1) Remove battery and engine undercover. Drain cooling system at engine and radiator. Drain engine oil. Remove radiator grill (remove parking light bulbs first), grill upper crossmember, radiator and cooling fan.

2) If equipped with air conditioning, remove cooling fans, disconnect condenser from radiator and place on bumper. Remove starter and exhaust heat shields, catalytic converter and air intake hose. Remove clutch cable, bracket and alternator.

3) If equipped with power steering, remove pump and place it with lines attached on frame rail. If equipped with air conditioning, disconnect compressor and place on frame rail with lines. Disconnect all electrical leads, control cables, vacuum lines and coolant hoses that might interfere with engine removal.

4) Disconnect fuel lines and clamp to prevent tank drainage. Remove sending units from cylinder head. Remove upper engine-to-transaxle bolts. Remove flywheel shield, lower engine-transaxle bolts, and side engine bolts. If equipped with auto transmission, remove converter shield and converter fixing bolts on drive plate. Clamp plate with converter locking tool (Mot. 582).

5) Attach lifting sling (Mot. 597) and raise engine until transaxle touches steering crossmember. Secure transaxle. Pull engine forward to disengage from transaxle. Remove engine from vehicle. If equipped with automatic transmission, attach retaining plate (B. Vi. 465) to prevent converter movement.

Installation — To install, reverse removal procedure noting the following: on manual transmission models, lightly grease the clutch shaft splines and the surface of the clutch thrust plate with Molykote BR 2 grease. Adjust clutch cable clearance. On automatic transmission models, lubricate the converter centering housing in crankshaft with Molykote BR 2 grease (or equivalent). Line up paint mark on converter facing part of driving plate blade sharp edges. Replace driving plate to converter bolts.

CYLINDER HEAD

Removal — 1) Disconnect battery. Remove radiator grill and upper crossmember. Drain cooling system at cylinder block and

radiator. Disconnect wiring, cables, and the heater hoses at water pump. Remove catalytic converter.

2) Remove water pump belt and air intake hose. Remove distributor, valve cover, and diagnostic socket. Disconnect fuel lines and clamp to prevent tank drainage. Unscrew rocker arm adjusting screws and remove pushrods, arranging in proper sequence.

3) Loosen cylinder head bolts and remove inner 6. Remove rubber washers and cups in spark plug recesses. Clamp rocker arm assembly with a rubber band or string around the 4 end bolts and remove rocker arm assemblies.

4) Unstick cylinder head from block by rotating cylinder head around centering dowel on distributor side. Tap each end of cylinder head with a plastic mallet on each side. See Fig. 1. DO NOT merely lift off cylinder head.

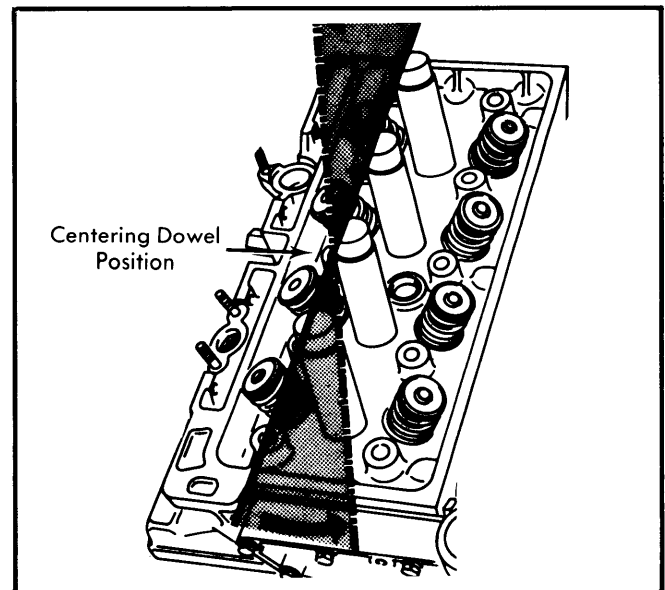


Fig. 1 Rotating Cylinder Head Around Centering Dowel

5) Raise cylinder head slightly and remove lifters, arranging them in sequence. Remove cylinder head and lifter chamber seal. Place liner clamp (Mot. 521-01) in position on cylinder block.

Installation — 1) Remove old gasket pieces with Magnus "Magstrip" or Decaplock "88" liquid. Remove any oil from cylinder head bolt holes with a syringe. Check cylinder liner protrusion as outlined under Pistons, Pins & Rings in this article.

2) Remove liner clamp. Ensure centering dowel and distributor drive gear are properly positioned in cylinder block. See Camshaft and Timing Chain in this Article. Position cylinder head gasket. See Fig. 2.

3) Screw alignment studs (Mot. 451) into indicated positions until ball makes contact with cylinder head gasket. Install lifter chamber gasket, ensuring ends do not overlap with cylinder head gasket. Place alignment gauge (Mot. 446) in cylinder block hole. See Fig. 2.

4) Place lifters in cylinder head in correct order. Tap lightly to seat in their housings. Install rocker arm assemblies to cylinder

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head. Ensure that 2 rocker arm supports with holes fit properly over their centering dowels. Place cylinder head on block. Be careful not to move lifter chamber gasket. Remove studs using "T" handle of tool set Mot. 451.

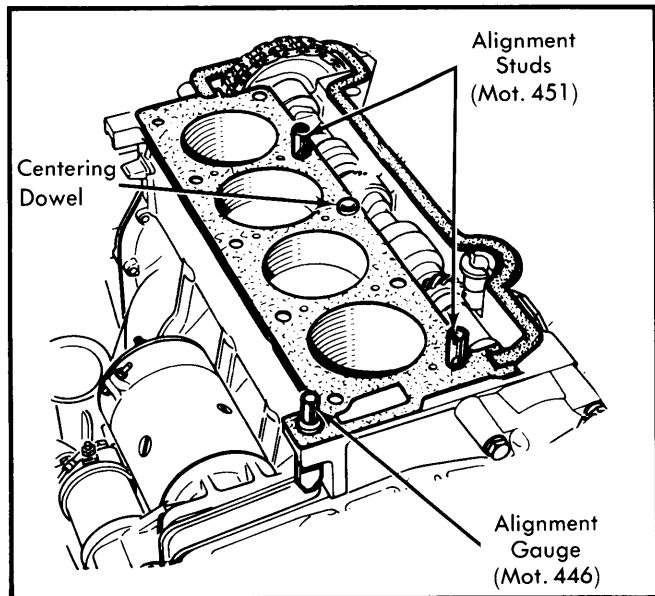


Fig. 2 Alignment Gauge, Studs and Centering Dowel Positioning

5) Lightly lubricate cylinder head bolts with engine oil. Insert bolts and tighten in correct sequence. See Fig. 3. Remove cylinder head alignment gauge (Mot. 446). Insert pushrods. Install remaining components in reverse order of removal and adjust valve clearance.

CYLINDER HEAD BOLTS

Tightening — Remove any oil from bolt holes with a syringe. Tighten bolts in 2 steps, first to 30 ft. lbs. (41 N·m), and then to 57-61 ft. lbs. (78-83 N·m). Run engine till thermostat opens and allow to cool 2½ hours. Loosen bolt No. 1 a half turn and retighten to 57-61 ft. lbs. (78-83 N·m). Repeat for remaining bolts in correct sequence.

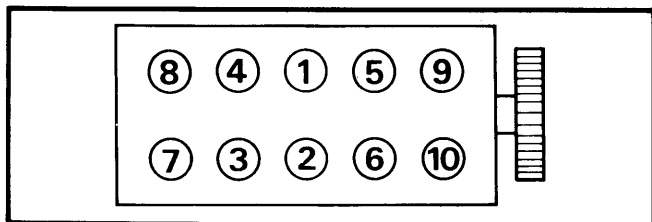


Fig. 3 Cylinder Head Bolt Tightening Sequence

VALVES

VALVE ARRANGEMENT

Right side — All intake.

Left side — All exhaust.

VALVE GUIDE SERVICING

1) With cylinder head removed, lay cylinder head on wedge shaped block so guide is vertical. Valve guide angles are 23°

for intake valves, 26° for exhaust valves. Push the guide out in a press, using mandrel from Mot. 356 tool set.

2) Examine the valve guide and determine whether it is original or a replacement. Replace with the next oversize. First oversize has 1 groove mark, 2nd oversize has 2 groove marks. Turn the cylinder head over on the block and ream the guide bore for valve guide. Ream to .516" (13.19 mm) for 1st oversize, .522" (13.25 mm) for 2nd oversize.

3) Fit the valve guide on the end of the mandrel with chamfer facing outward. Lubricate the guide and press in until positioned correctly. Distance between valve seat and end of valve guide should be 1.575" (40 mm) for intake valves, 1.220" (31 mm) for exhaust valves.

4) Ream the valve guide bore to accept valve stem using Mot. 357. Recut valve seat.

VALVE SPRINGS

Removal — Disconnect battery. Remove valve cover. Remove distributor (if necessary). Position piston corresponding to spring to be removed at TDC. Unscrew appropriate rocker arm screw and remove pushrod. Compress valve spring with spring compressor (Mot. 382). Hold valve stem with pliers and remove split keepers, cap and springs.

Installation — Reverse removal procedure and note: Ensure valve spring is installed with closest coil spring spacing toward cylinder head.

ROCKER SHAFT

Disassembly — Remove the retaining roll pin from the rocker shafts. Note relative positions of parts and remove and clean them.

NOTE — Cup plugs at ends of shafts must not be removed.

Reassembly — Install the 2 shafts into supports at clutch end of head. Install intake shaft retaining pin. Install the remaining parts and install the exhaust shaft retaining pin.

NOTE — Supports 1 and 4 are identical, with lubrication holes and locating dowel. Supports 2, 3 and 5 are identical, with no lubrication hole. The 2 shafts are also identical.

VALVE CLEARANCE ADJUSTMENT

Set valves cold. To adjust, rotate crankshaft until valve listed in column 1 of table is fully open, then adjust valves specified in second column of table. Note that valves and cylinders are numbered from rear to front.

Valve Adjustment	
Valve Open	Adjust
No. 1 Exhaust	No. 3 Intake & No. 4 Exhaust
No. 3 Exhaust	No. 4 Intake & No. 2 Exhaust
No. 4 Exhaust	No. 2 Intake & No. 1 Exhaust
No. 2 Exhaust	No. 1 Intake & No. 3 Exhaust

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PISTONS, PINS & RINGS

CYLINDER LINERS & PISTON ASSEMBLY

Removal — Remove cylinder head, oil pan, and oil pump. Mark the connecting rods and caps on camshaft side. Remove caps and bearings. Remove liner clamp and remove piston and rod assembly from block with liner.

Installation — 1) Check cylinder liner protrusion **WITHOUT** sealing "O" ring installed on liner base. Install dial indicator (Mot. 251-01) and measuring block (Mot. 252-01) and measure protrusion. It should be .004-.007" (.10-.17 mm). See Fig. 4. If protrusion is incorrect, check with a new set of liners to determine if the problem is the block or the liners.

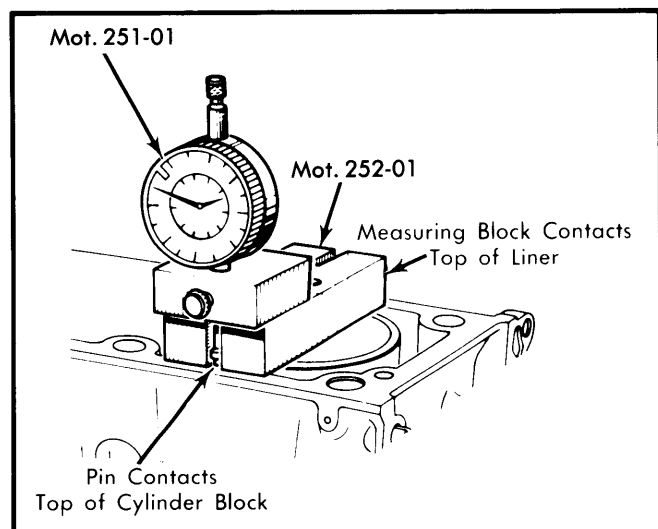


Fig. 4 Checking Cylinder Liner Protrusion

2) Position the liners with "O" rings installed so that difference in protrusion is not greater than .002" (.04 mm) on any 2 adjacent cylinders. Liners should also be stepped down from front to rear or vice-versa. Oil the piston and connecting rod assembly and insert to liner using ring compressor (Mot. 851).

3) Flat surface of big end of connecting rod must be parallel to flat surface at top of liner. Connecting rod markings face camshaft. Install liner clamp (Mot. 521-01). Place connecting rods with bearings on lubricated rod bearing journals and install matching rod caps and bearings. Install remaining components in reverse order of removal.

PISTON PIN

Removal — Remove piston from liner and rings from piston. Using pin press (Mot. 574-04), press out piston pin.

Installation — 1) Position piston with arrow facing flywheel. Index mark on connecting rod must face camshaft. Heat connecting rod to 482°F (250°C).

2) Insert centering guide (of tool kit Mot. 574) into piston. Place the connecting rod in the piston. Lightly oil the piston pin with Molykote M55 (or equivalent) and press in piston pin until the guide butts up against support block.

NOTE — Check to ensure that pin is recessed from piston diameter. See Fig. 5.

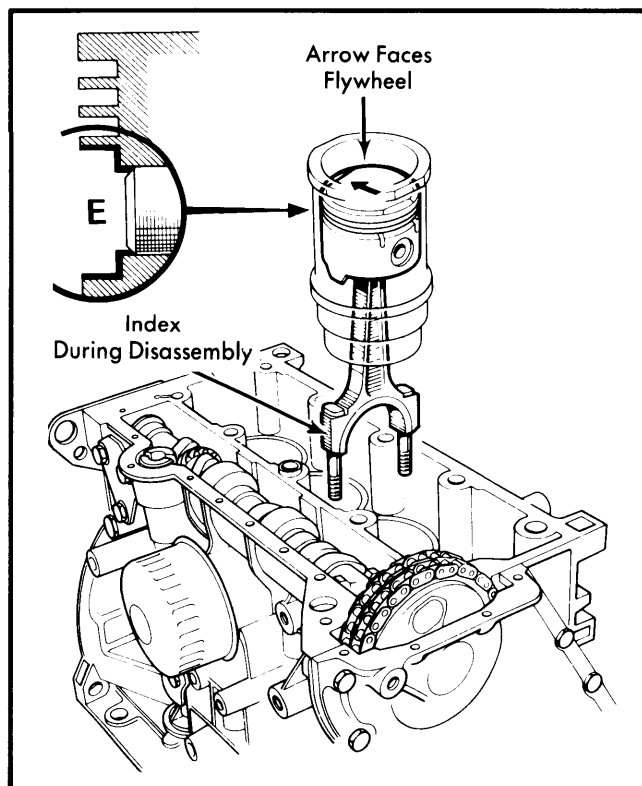


Fig. 5 Piston Mounting & Identification Marks

PISTON RINGS

Fit rings to pistons with "O" mark or "TOP" facing up. Oil pistons before inserting to liners. Rings are pre-gapped. Ensure that flat surface of connecting rod is parallel to flat surface on liner.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

MAIN & CONNECTING ROD BEARING SERVICE

1) Remove cylinder head and oil pan. Invert engine and mark bearing caps. Remove connecting rod bearing caps and all main bearing caps except No. 1. Remove all bearing shells.

2) Remove No. 1 main bearing cap by tapping underneath with a hammer at each end. Remove oil seals, crankshaft, main bearings and thrust washers.

3) Use a micrometer and measure crankshaft journals. If any main bearing journal is worn beyond 2.148" (54.55 mm) or any connecting rod journal is worn beyond 1.880" (47.75 mm), crankshaft must be reground and fitted with new bearings.

NOTE — Journals are roll hardened. Make sure roll hardening remains intact over a 140° section facing rotational centerline of crankshaft. See Fig. 6.

4) Install upper main bearings (they have lubrication holes). Lubricate bearings and crankshaft journals. Fit crankshaft to block. Insert thrust washers with white metal face toward the crankshaft. Fit main bearings No. 2, 3, 4, and 5 to caps (they have no lubrication holes).

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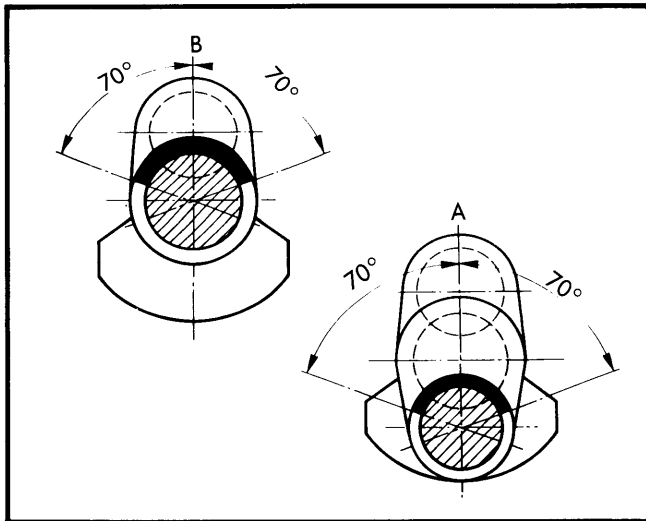


Fig. 6 Crankshaft MUST Maintain Roll Hardened Surfaces as Shown

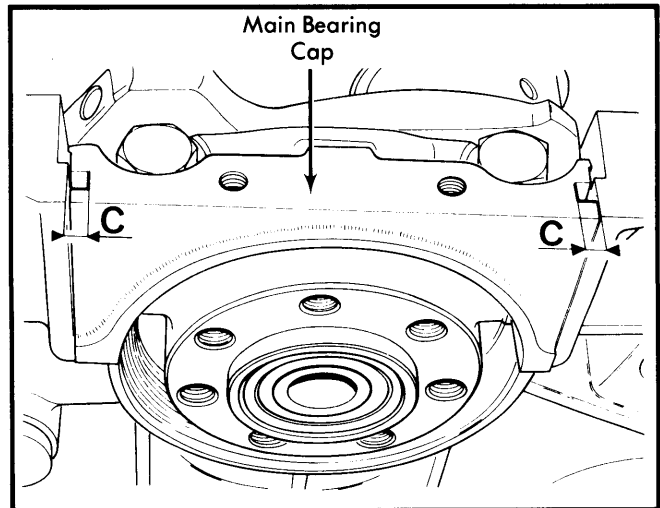


Fig. 7 Measurement for Seal Selection

5) Lubricate bearings and install caps without tightening bolts. Fit rear main bearing and cap as outlined in Rear Main Bearing Cap & Oil Seal procedure. Fit upper connecting rod bearings and slide onto crank shaft. Fit lower half of bearing and tighten all caps. Ensure crankshaft is free to turn.

6) Use a dial indicator and check crankshaft end play. If end play exceeds .009" (.23 mm) replace thrust washers to obtain correct specification.

REAR MAIN BEARING CAP AND OIL SEAL

Insert bearing to cap. Temporarily install cap and tighten bolts. Measure dimension "C" between cylinder block and main bearing seal housing. See Fig. 7. If less than .20" (5 mm) select seals .201" (5.1 mm) thick. If greater than .20" (5 mm), select seals .213" (5.40 mm) thick (white marking).

2) Remove cap. Place 2 side seals on cap with seal groove facing outward. Seal protrusion on cylinder block side should be .031" (.2 mm) Lubricate seals and bearing and install cap over 2 centering studs, placing foil shims between block and seals to protect seals. When cap is almost in place, use a ruler to ensure seals still protrude slightly.

3) Remove shims and studs and tighten bolts. After checking end play, install oil seal with Mot. 259-01. Be careful of oil seal lip.

CAMSHAFT

CAMSHAFT & TIMING CHAIN

Removal — Remove the cylinder head, distributor, and camshaft end bearing cover plate. Remove oil pan and crankshaft pulley. Remove timing cover, and timing chain tensioner with thrust plate and filter. Remove 2 chain guides. Remove crankshaft pulley key, and remove crankshaft sprocket and chain together using puller (Mot. 49). Screw bolt (Mot. 525) into crankshaft and then remove camshaft.

Installation — 1) Lubricate the camshaft bearings and slide the camshaft in, but not all the way. Place the chain over the camshaft sprocket. Line up the mark on the sprocket with center of the crankshaft and camshaft. See Fig. 8.

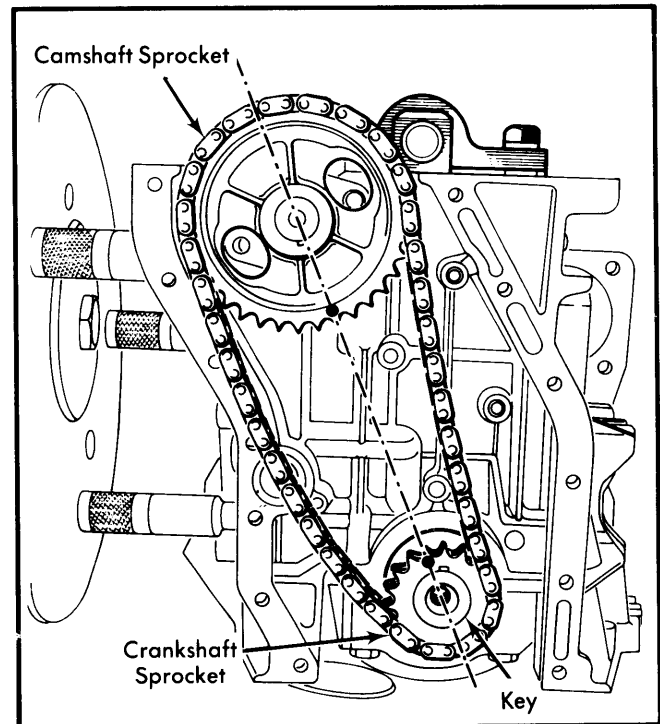


Fig. 8 Alignment of Camshaft and Crankshaft Sprockets

2) Place the key on the crankshaft. Rotate the crankshaft to bring the key to the top. Place the crankshaft sprocket on the chain. The timing mark must line up with the camshaft sprocket mark as well as the center of the camshaft and crankshaft. See Fig. 8.

3) Place the sprocket on the crankshaft. Use tool Mot. 525 to install sprocket, while gradually pushing camshaft into position. Insert and tighten 2 camshaft clamp bolts. Install chain tensioner with oil filter and thrust plate. Tighten bolts.

4) Install chain guides. If chain gauge (Mot. 420) is available, place on the chain. Push the 2 guides against the gauge, tighten bolts and remove the gauge. See Fig. 9. If gauge is not available, stretch the chain and position the guides so there is

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.012-.020" (.30-.50 mm) between chain and the guides. Tighten the bolts.

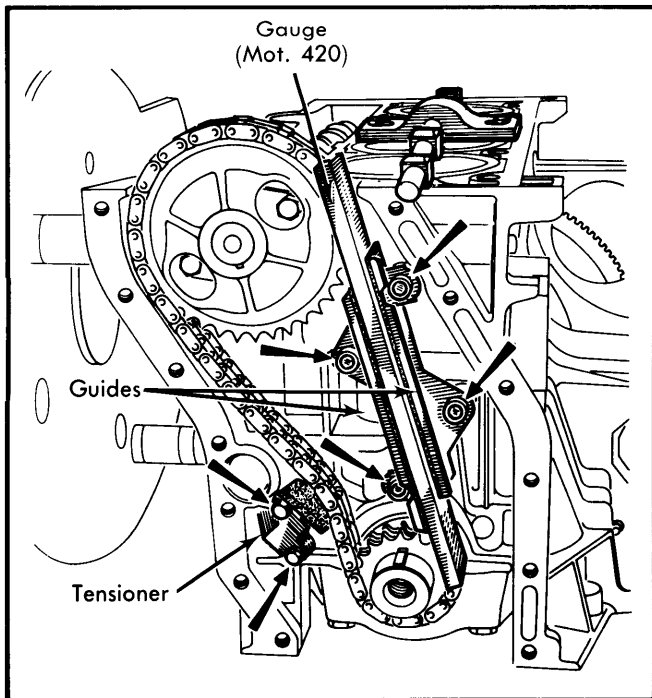


Fig. 9 Adjusting Timing Chain Tension Using Gauge. Broad Arrows Indicate Tensioner & Guide Bolts.

5) Install crankshaft pulley key. Install timing cover centering dowels and install timing cover to block. Install new oil seal as follows: Place oil seal over assembly sleeve of installation tool (Mot. 525). Place assembly against timing cover and screw bolt into crankshaft until seal contacts timing cover. Install remaining components in reverse order of removal.

DISTRIBUTOR DRIVE GEAR

Rotate engine to bring No. 1 cylinder to TDC. Install distributor drive gear with smaller offset toward camshaft. Angle formed by drive gear slot and a line perpendicular to camshaft should equal 53°. Fill camshaft oil galley with oil and install rear camshaft bearing cover plate and gasket.

ENGINE OILING

Crankcase Capacity — 4.5 quarts with filter change.

Oil Filter — Disposable canister type.

Normal Oil Pressure — 29 psi (2.1 kg/cm²) at idle, 58 psi (4.0 kg/cm²) at 4000 RPM.

OIL PUMP

Removal — Drain oil pan and remove flywheel protective cover (if necessary). Remove oil pan, oil pump and 2 rotors.

Disassembly — Unscrew suction pipe bolts. Remove cotter pin from pressure relief valve and remove spring cup, spring and piston.

Inspection — Check clearance of 2 rotors in positions shown in Fig. 11. Dimension "A" should be .002-.011" (.04-.09 mm).

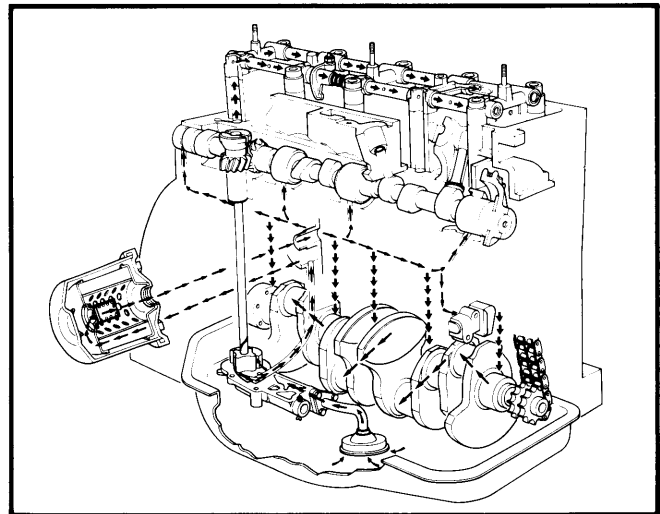


Fig. 10 Engine Oiling System

Dimension "B" should be .001-.006" (.02-.14 mm). If clearance exceeds specifications, replace rotors.

Reassembly — Place piston, spring, and spring cup in pump body. Install cotter pin, suction pipe and gasket. Tighten bolts and bend lock plate over.

Installation — Install assembly with rotors to block. Install oil pan and new gasket.

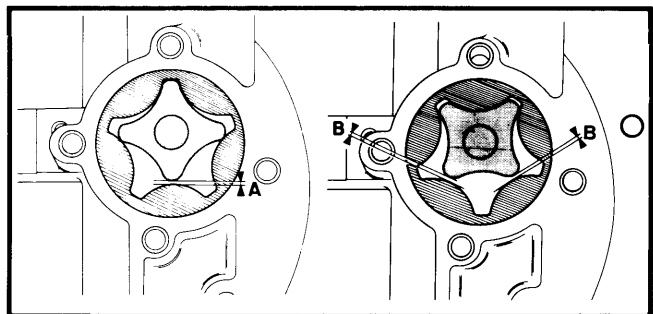


Fig. 11 Oil Pump Rotor Clearances

ENGINE COOLING

Cooling System Capacity — 7.5 quarts (fill at reservoir tank).

WATER PUMP

Removal and Installation — Disconnect battery. Drain cooling system and remove upper grill crossmember, grill, radiator and cooling fan. Remove water pump drive belt and pump fixing bolts. Free pump by tapping with a mallet. To install, reverse removal procedures noting that seal is dry mounted.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N·m)
Connecting Rod Cap Nuts	33 (45)
Crankshaft Pulley Bolt	67 (91)
Cylinder Head BoltsⓁ	57-61 (78-83)
Flywheel Bolt	37 (50)
Main Bearing Caps	48 (65)

Ⓛ — See text.

Renault Engines

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ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Year	Displ.		Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke	
	cu. ins.	cc					in.	mm	in.	mm
1981	100.5	1647	Fuel Inj.	81.5@5500	86.3@2500	8.6:1	3.10	79	3.30	84

VALVES

Engine & Valve	Head Diam. In. (mm)	Face Angle	Seat Angle	Seat Width In. (mm)	Stem Diameter In. (mm)	Stem Clearance In. (mm)	Valve Lift In. (mm)
1647 cc Intake	1.524 (38.7)	90°	90°	.059-.071 (1.5-1.8)	.313-.314 (7.95-7.98)	.001-.003 (.025-.076)	.....
Exhaust	1.358 (34.5)	90°	90°	.039-.053 (1.00-1.35)	.313-.314 (7.95-7.98)	.001-.003 (.025-.076)	.....

PISTONS, PINS, RINGS

Engine	PISTONS	PINS		RINGS		
	Clearance In. (mm)	Piston Fit In. (mm)	Rod Fit In. (mm)	Rings	End Gap In. (mm)	Side Clearance In. (mm)
1647 cc	.0016-.0024 (.04-.06)	Free Fit	Press Fit	#1 #2 #3	.012-.018 (.30-.45) .012-.018 (.30-.45) .....	..... ..... .....

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

Engine	MAIN BEARINGS			CONNECTING ROD BEARINGS			
	Journal Diam. In. (mm)	Clearance In. (mm)	Thrust Bearing	Crankshaft End Play In. (mm)	Journal Diam. In. (mm)	Clearance In. (mm)	Side Play In. (mm)
1647 cc	2.157 (54.80)	.....	#3	.002-.009 (.05-.23)	1.890 (48.00)	.....	.012-.022 (.31-.57)

CAMSHAFT

Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1647 cc	①	.....

① — End play .002-.005" (.05-.12 mm).

VALVE SPRINGS

Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1647 cc Outer	2.138 (54.3)	.....	117@1.201 (53@20.5)
Inner	1.843 (46.8)	36@.95 (16.3@24.5)	.....

VALVE TIMING

Engine	INTAKE		EXHAUST	
	Open (BTDC)	Close (ABDC)	Open (BBDC)	Close (ATDC)
1647 cc	21°	59°	59°	21°